



FEDERAL LAW ENFORCEMENT  
WIRELESS USERS GROUP  
WASHINGTON, D.C.

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March 19, 2001

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FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY

Magalie Roman Salas  
Secretary  
Federal Communications Commission  
TW-A325  
445 Twelfth Street, SW  
Washington, DC 20554

**Re: Comments regarding the Commission's Notice of Proposed  
Rulemaking, *In the Matter of Inquiry Regarding Software Defined  
Radios*, in ET Docket No. 00-47 /**

Dear Ms. Salas:

On behalf of the Federal Law Enforcement Wireless Users Group (FLEWUG) and pursuant to Section 1.419 of the Commission's rules, 47 C.F.R. § 1.419 (1999), enclosed herewith for filing are an original and four (4) copies of the FLEWUG's Comments in the above-referenced proceeding.

Kindly date-stamp the additional, marked copy of this cover letter and return it in the envelope provided.

Should you require any additional information, please contact the undersigned.

Respectfully submitted,

James J. Flyzik  
Deputy Assistant Secretary  
(Information Systems) and  
Chief Information Officer,  
Department of the Treasury

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FILE

Before the  
Federal Communications Commission  
Washington, DC 20554

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**FEDERAL COMMUNICATIONS COMMISSION  
OFFICE OF THE SECRETARY**

In the Matter of )

Inquiry Regarding Software Defined Radios )

ET Docket No. 00-47

**FEDERAL LAW ENFORCEMENT WIRELESS USERS GROUP'S**  
**COMMENTS IN RESPONSE TO NOTICE OF PROPOSED RULEMAKING**

1. The Federal Law Enforcement Wireless Users Group (FLEWUG)<sup>1</sup> respectfully submits the following Comments in response to comments filed by other parties regarding the Commission's Notice of Proposed Rulemaking (NPRM), *In the Matter of Inquiry Regarding Software Defined Radios*. In the Software Defined Radio (SDR) Notice of Proposed Rulemaking (NPRM), the Commission requests information from the wireless community on SDR technology to help guide possible policy and regulation in such matters.

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<sup>1</sup> The FLEWUG is comprised of law enforcement and public safety officials from the Department of the Treasury, Department of Justice, Department of the Interior, Department of Agriculture, Department of Defense, Department of Health and Human Services, United States Postal Service, United States Postal Inspection Service, National Telecommunications and Information Administration, Federal Emergency Management Agency, Internal Revenue Service, Federal Bureau of Investigation, United States Secret Service, United States Coast Guard, United States Capitol Police, Drug Enforcement Administration, United States Park Police, Immigration and Naturalization Service, United States Customs Service, Bureau of Alcohol, Tobacco, and Firearms, United States Mint, National Communications System, Defense Information Systems Agency, National Security Agency, Federal Law Enforcement Training Center, Bureau of Engraving and Printing, United States Marshals Service, National Institute of Standards and Technology, United States Forest Service, United States Fish and Wildlife Service, Federal Bureau of Prisons, Bureau of Land Management and National Park Service.

## **I. BACKGROUND**

2. In light of its obligations to the federal user community and to the public safety community at large, the FLEWUG has a significant interest in the outcome of this proceeding. The FLEWUG, as are many other entities throughout the public safety community and private industry, is encouraged by the potential for SDRs to enhance communications efficiency, adaptability, and flexibility. At the same time, the FLEWUG asks the Commission to continue to balance the need for innovation against the ongoing operational needs of the public safety community to ensure that vital public safety communications remain entirely free from interference.<sup>2</sup>

## **II. Equipment Approval Process**

3. In its response to the Notice of Inquiry (NOI) preceding the NPRM, the National Telecommunications and Information Administration (NTIA) related its finding that SDR technology has not yet evolved to the point where it could determine the radio frequency (RF) parameters by examining only the software or hardware. The NTIA was of the opinion that separate hardware or software approval would only be possible if a consistent, predictable connection between the software and hardware were established. Therefore, the Commission proposes, as supported by the SDR Forum's comments to the NOI, that each combination of hardware and software that a radio supports should be tested. The FLEWUG concurs with the conclusions of the NTIA, noting the NTIA's unique position and significant experience in its role as the regulator of federal spectrum, and agrees that the solution proposed by the Commission is the most advisable course of action at this time.

4. Regarding the Commission's finding, as supported by a substantial number of commenters to the NPRM, that current equipment authorization procedures could be overly

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<sup>2</sup> See, e.g., FLEWUG NOI Reply Comments, July 17, 2000, at Para. 18.

burdensome when applied to SDRs and could limit the benefits of the enhanced flexibility that might eventually be available through SDR technology, the FLEWUG does not disagree. However, noting the recognized potential of SDRs to facilitate rapid equipment reconfiguration, the FLEWUG strongly feels that such changes, if any, must be accomplished in a way that ensures communications security, essential for sensitive and mission-critical activities conducted by numerous federal entities, is maintained in the process.

### **III. PROPOSED RULE CHANGES**

5. The Commission, citing the need to streamline the equipment approval process as contemplated above as the most immediate need in the development of SDR technology, has declined at this time to propose further changes to the Rules. Instead, the Commission has agreed to propose additional rule changes in the future as warranted, citing the necessity to strike an appropriate balance between administrative burden and the need to ensure compliance with the Commission's technical rules. The FLEWUG agrees with both the Commission's conclusion and its basis.

6. The FLEWUG, as stated above, is primarily concerned about the need to completely protect public safety equipment from interference. The Commission's determination here will strike a balance between this immediate need and the removal of administrative burdens as requested by a number of commenters. In that regard, the FLEWUG takes the opportunity to once again request that the Commission consider creating receiver protection standards for public safety equipment to ensure that such equipment is not interfered with when the eventual rule changes discussed by the Commission are formulated and put into effect.

### **IV. Definition of Software Defined Radio**

7. The Commission proposes to define an SDR as a radio that includes a transmitter whose operating parameters, including the frequency range, modulation type, or maximum radiated or

conducted output power, can be altered by making a change in software without making any hardware changes. At the same time, the Commission has also sought specific input regarding the adequacy of this definition and any wording that may be more suitable.

8. The FLEWUG has researched this issue and believes the following definition reflects the characteristics of current-generation SDRs. The FLEWUG requests consideration of this definition along with those that may be put forth by other commenters to the NPRM as capturing the critical technical elements of an SDR:

“A software radio is a radio whose channel modulation waveforms are defined in software. That is, waveforms are generated as sampled digital signals, converted from digital to analog via a wideband DAC [digital to analog converter] and then possibly unconverted from IF [infrared frequency] to RF [radio frequency]. The receiver, similarly, employs a wideband ADC [analog to digital converter] that captures all of the channels of the software radio node. The receiver then extracts, downconverts, and demodulates the channel waveform using software on a general-purpose processor. Software radios employ a combination of techniques that include multi-band antennas and RF conversion; wideband ADC and DAC [digital to analog converter]; and the implementation of IF, baseband, and bitstream processing functions in general-purpose programmable processors.”<sup>3</sup>

## **V. New Class III Permissive Change**

9. In recognition of the unprecedented ability of SDRs to alter equipment operating parameters in the field and in further acknowledging that the current licensing process would restrict the user’s ability to take advantage of these benefits, the Commission has proposed a new class of permissive change, Class III, based on frequency, power, and modulation type, which would streamline equipment authorization procedures. At the same time, the Commission has

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<sup>3</sup> Dr. Joseph Mitola III, “Wireless Architecture for the 21st Century,” *IEEE Communications Magazine*, May 1995, as cited by the Software Defined Radio Forum, <http://ourworld.compuserve.com/homepages/jmitola/>.

declined to introduce a self-approval process for SDR equipment, noting that such changes would be premature, citing again the need for further technical evaluation and experience.

10. As before, the FLEWUG concurs with the Commission's reasoning and believes that the proposed change would balance the advantages of new technology with the need to maintain security and stability for both new and legacy systems, and would ensure the continued ability of public safety users to protect life and property—in a secure communications environment as warranted.

11. The FLEWUG generally agrees with those commenters that feel the proposed new permissive change would provide certain advantages compared with the existing requirement for new identification numbers. It would eliminate the need to re-label equipment when new software is loaded and would streamline the filing procedure for changes to approved devices. Particularly during multijurisdictional incident responses such as terrorist situations or wildfire suppression, when federal public safety entities share with or distribute equipment to state and local units, the proposed permissive change could offer significant advantages.

12. The FLEWUG feels, however, that the new class of permissive change should be restricted to software changes only for the present time. Along those lines, the FLEWUG believes that Class III permissive changes should only be made to equipment to which no hardware changes have been made from the originally approved device. This restriction would eliminate ambiguity about which hardware and software combinations have been approved. The FLEWUG is optimistic that further research by the NTIA and other entities will provide sufficient data to allow for further development but reinforces its view that this change should come incrementally, as suggested by the Commission and numerous commenters to the NOI.

## **VI. Unauthorized Software Modifications**

13. The FLEWUG concurs with the position of the NTIA that SDRs should be built to a common standard that uses authentication to ensure that radios can only run authorized

waveform software and that radios should have digital serial numbers to identify groups of users, such as commercial or government.

14. On the issue of encryption, the FLEWUG notes that Rijndael has been approved as the algorithm for federal Advanced Encryption Standard (AES) use and that other issues relating to AES are currently in an emerging state of development. The FLEWUG therefore advises the Commission not to promulgate any standards related to SDRs and encryption in the near term that would be cumbersome and/or require change to the Rules or additional equipment modifications.

## **VII. Other Matters**

15. AirNet and the NTIA have concluded that additional measurements may be necessary. AirNet believes that radio equipment should be tested for linearity to ensure that software modifications will not degrade out-of-band emission performance. The NTIA believes that tests should be performed on adaptive spectrum access algorithms and on signal distortions caused by digitization. Citing the theme of conservatism evident elsewhere in the Commission's conclusions in this matter, the FLEWUG encourages the Commission to seriously consider the findings of these entities and others concerned with preventing future problems with SDR operation.

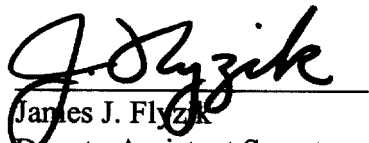
16. As already discussed above, it seems likely that future modifications to the Rules or other guidelines will be needed to ensure that the potential benefits of SDRs are utilized, while also ensuring that public safety, commercial, and other vital services on the increasingly crowded radio spectrum remain free from harmful interference. The FLEWUG urges the Commission not to eliminate any suggested paths to this end at this critical juncture.

## **VIII. CONCLUSION**

17. In summary, whether dealing with any aspect of changing its Rules or procedures, including equipment licensing and modification, or even its basic assumptions about operating characteristics, the FLEWUG urges the FCC to continue its efforts to balance the need for innovation against the ongoing operational needs of the public safety community.

18. In particular, the FLEWUG specifically urges the Commission to limit its changes to only those Rules that are administratively essential to further SDR development and to continue to withhold those Rules relating to technical characteristics that the Commission itself has acknowledged are still very much unknown. The FLEWUG requests that the Commission resolve any doubts about approving interim or final equipment standards or operating procedures for SDRs, or any other emerging radio technology, to ensure that mission-critical public safety wireless communications are not subject to any degree of interference at any time.

Respectfully submitted,

  
James J. Flyzik  
Deputy Assistant Secretary  
(Information Systems), and  
Chief Information Officer,  
Department of the Treasury



Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554

In the Matter of

Inquiry Regarding Software Defined Radios

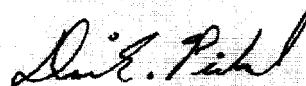
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ET Docket No. 00-47

**CERTIFICATE OF SERVICE**

I, David E. Pickeral, Associate, Booz Allen & Hamilton Inc., 8283 Greensboro Drive, McLean, Virginia, 22102-3838, hereby certify that on this date I caused to be served, by first-class mail, postage prepaid (or by hand where noted) copies of the Federal Law Enforcement Wireless Users Group's Comments regarding the Commission's Notice of Proposed Rulemaking, *In the Matter of Inquiry Regarding Software Defined Radios*, the original of which is filed herewith and upon the parties identified on the attached service list.

DATED at Fair Oaks, Virginia this 19<sup>th</sup> day of March 2000.



David E. Pickeral

## **SERVICE LIST**

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